

ROCKY INTERTIDAL ECOLOGICAL MONITORING IN

CHANNEL ISLANDS NATIONAL PARK

CALIFORNIA 1986-1987



# Channel Islands

National  
Park

National Park Service  
U.S. Department of the Interior



ROCKY INTERTIDAL ECOLOGICAL  
MONITORING IN CHANNEL ISLANDS  
NATIONAL PARK CALIFORNIA  
1986-1987

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# ROCKY INTERTIDAL ECOLOGICAL MONITORING IN CHANNEL ISLANDS NATIONAL PARK, CALIFORNIA 1986-1987

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## ABSTRACT

Rocky Intertidal resources of the Channel Islands have been monitored twice each year since 1982 by the National Park Service. Percent cover of four Indicator species, two aggregate plant and animal taxa, tar, and bare rock were determined from photoquadrats. Size and abundance of black abalone in fixed plots were measured on site. In 1986 two permanent monitoring stations added on Santa Rosa Island brought the total number of stations in Channel Islands National Park to 13. New data from 1986 and the spring of 1987 are presented. Photoplot data from January 1982 at Cat Rock on Anacapa Island have been analyzed, giving pre-treatment comparisons of experimental plots. Scraped and trampled plots in the rockweed and scraped plots in the mussel zones show that these species have not recovered to pre-treatment levels after five years. The cooperative program of black abalone tagging by the California Department of Fish and Game continued at San Miguel and Santa Rosa Islands. Recoveries of tagged abalone have been good, and preliminary analysis showed growth of medium sized abalone was slow, while older, larger individuals actually decreased in size. Numbers of black abalone in monitoring plots at several locations declined significantly since 1985.

## INTRODUCTION

Located in the transition zone between the Oregonian and Californian Provinces, the California Channel Islands harbor a rich and diverse assemblage of marine life. With nearly five times the rocky shoreline of the Southern California Bight mainland (Emery 1960), the islands possess significant rocky intertidal area. Five of the Channel Islands are within Channel Islands National Park, located off the coast of southern California, near the cities of Santa Barbara and Ventura.

The relative isolation of the islands is primarily responsible for the pristine conditions found in the park. Noxious elements from the large human population of southern California affect island ecosystems. Pollution from the mainland is carried to the islands by ocean currents which sweep up the coast through the

Southern California Bight. Toxins and heavy metals accumulate in sediments and in tissues of filter feeders. Increased off development activity in the Santa Barbara Channel also threatens this sensitive ecosystem. Careless visitors can even cause damage through trampling, rock turning, and collecting (Uttler 1978). The primary purpose of this rocky intertidal ecological monitoring program is to provide information on changes in abundance and distribution of indicator organisms that may be - used for management decisions regarding visitor use and impact in intertidal ecosystems.

Permanent monitoring sites were established in the rocky intertidal area at Anacapa Island in 1982 as part of the long-term monitoring program at Channel Islands National Park (VTN 1983). These sites were originally established to monitor visitor impact at the most frequented areas. Abundance of selected dominant organisms representing different intertidal zones was monitored by photographing permanent quadrats each spring and fall. Additional photomonitoring sites were established on San Miguel, Santa Barbara, and Santa Rosa Islands along with black abalone monitoring quadrats in 1985 (Richards 1987). Due to low visitation on these islands, the purpose of the monitoring was primarily to establish a reference point, study natural variability within the system, **and monitor for pollution** and fishery threats. During 1986, two new monitoring sites were established on Santa Rosa Island.

Many intertidal areas in Channel Islands National Park have large standing stocks of black abalone, *Haliotis cracherodii*, but conditions have changed. These populations have been protected by a 20 foot minimum harvesting depth restriction, but effective January 1, 1985 this depth restriction was rescinded ending protection for many of the dense intertidal populations. Black abalone now constitute most of the California commercial abalone harvest, in terms of pounds landed.

In August 1987, the U.S. Fish and Wildlife Service released 50 southern sea otters at San Nicolas Island as part of the sea otter relocation plan. Although sea otters are a major natural predator on abalone, overall impact of sea otter predation on fishery stocks was minimized by establishment of an otter free zone throughout the rest of the Southern California Bight, including the islands in Channel Islands National Park.

Reliable growth studies of black abalone are scarce. In cooperation with this monitoring program, California Department of Fish and Game biologists are conducting growth studies of black abalone on Santa Rosa and San Miguel Islands.

## METHODS

Monitoring sites were established at 13 sites on four islands in Channel Islands National Park (Fig. 1). The sites were chosen to represent the range of typical bedrock intertidal communities in the park. Detailed site descriptions are given in an Intertidal Monitoring Handbook

(Richards and Davis 1988). Two new sites, established on Santa Rosa Island in November and December 1986, are called Northwest Talcott, located on the northwest portion of the island inside Talcott Shoal, and East Point, located at the tip of East Point.

Four dominant species, or species complexes, are monitored at each of the sites along with bare rock and tar. Acorn barnacles dominate the highest zone and are a complex of species, mostly *Chthamalus fissus/dalli* and *Balanus glandula*. The turfweed, *Endocladia muricata*, forms a low turf in the high intertidal zone, dominant just below the acorn barnacle zone. The rockweeds *Pelvetia fastigiata* and *Hesperophycus harveyanus* are mid-intertidal, and form thick greenish-brown bands at most sites. *Mytilus californianus* is the dominant mussel on the outer coast and occupies the lowest zone monitored. Since they dominate the lower rocks at the Landing Cove on Santa Barbara Island so completely, the red algal turf composed of *Gigartina canaliculata* and *Gelidium* spp. are monitored there.

The miscellaneous algae category most commonly includes, *Ulva* spp., *Rhodoglossum affine*, and both crustose and articulate coralline algae species. *Gigartina canaliculata*, is included in the miscellaneous algae category at sites other than the Santa Barbara Landing Cove. The miscellaneous animal category consists primarily of small limpets, chitons, and gooseneck barnacles, *Pollicipes polymerous*.

The Anacapa stations were monitored in February, March, and December 1986, and in April 1987. San Miguel Island sites were monitored in March and November 1986, and March 1987. Santa Rosa Island sites were monitored in April, November and December (East Point) 1986, and March and June (Northwest) 1987. Santa Barbara Island sites were monitored in April and December 1986, and April 1987. General observations of conditions include sampling trips in the spring and fall of 1985 in addition to the 1986 and 1987 trips listed above.

Each monitoring station consists of at least five permanently marked photoquadrats in each intertidal zone, and, at most sites, five black abalone plots. At most sites, four zones are represented, but at Ford Point and Johnsons, Lee (Santa Rosa Island) the rockweed zone is absent. Five 50 x 75cm photoquadrats were established in each of the four zones (Richards and Davis 1988). Color 35mm slides were taken of each quadrat in the spring and fall. The percent cover of indicator organisms, bare rock and tar was estimated by projecting the slide onto a 100 point grid and scoring whatever was located at each point. Only the primary cover was estimated with this technique, so no layering was measured. At Cat Rock (Anacapa Island) nine quadrats were established in each zone, three for each of three treatments; trample, scrape, and control (VIN 1984). Middle Anacapa is divided into two areas, East and West, by an impassable surge channel. The East portion has only three repli-

cates that were established in each zone.

Black abalone were sampled at most sites by counting and measuring all abalone within the five plots at the site (Richards and Davis 1988). Size frequencies are reported in three size classes: juveniles (<44mm), adults (44 -126mm), and legally harvestable adults (> 126mm). The average size at which black abalone reach sexual maturity is 44mm (Leighton and Boolootian 1963). The abalone were not removed from the rock during sampling. Individuals in crevices or under other abalone that could not be measured accurately were recorded as the best approximate length. Both abalone and photoquadrat data were entered into files in SPSS/PC + and dBase III + for analysis and archiving.

California Department of Fish and Game biologists, in cooperation with this study, tagged abalone for growth measurements at San Miguel and Santa Rosa Islands. Adult black abalone were tagged with numbered stainless steel washers wired to their shells. Juvenile abalone were tagged with stainless steel bands, glued to their shells with cyanoacrylate (Superglue Gel). Additional abalone were tagged in 1987, including individuals at the Northwest site (Santa Rosa Island). Tagged abalone at Anacapa Island were only re-sampled in normal monitoring and were not removed from rock for accurate measurement. A three by 18 meter transect was established at East Point site (Santa Rosa Island) instead of the usual

five plots due to the complexity of the microtopography of the site.

## RESULTS

### PHOTOQUADRAT DATA

The photoquadrat data presented in tables 1-16, are means of percent cover rounded to the nearest whole number for all quadrats in a specific zone at each site. The total number of points indicated for each zone reflects the number of identifiable points from a possible maximum of 100 points per quadrat. East site (Middle Anacapa Island) and Cat Rock (Anacapa Island) have only three replicate quadrats per zone and therefore have a maximum of only 300 points. Bare rock in this study includes rock covered with blue-green algae or shells of dead mussels or barnacles.

#### Anacapa Island

The rockweed intrusion into barnacle quadrats at Cat Rock (Anacapa Island) continued, particularly in the experimentally scraped quadrats (Table 4). Barnacle cover in the scraped quadrats remained at or slightly above the pretreatment 1982 levels. Acorn barnacle recruitment in spring 1987, was high in experimentally scraped quadrats in other zones, but most notably in the rockweed zone where acorn barnacles covered an average of 41 percent of the substrate. The turfweed, *Endocladia muricata*, has been increasing at all sites and is near 1982 levels at the Anacapa Island sites (Tables 1-6). Rockweed cover in scraped and trampled experimental quadrats at Cat Rock (Anacapa Island) declined dramatically after treatment in January

1982 (Tables 18 and 19). Rockweed quadrats affected by both treatments have shown no recovery in five years. Little change was seen in mussel cover during 1986.. Experimentally scraped quadrats showed no resurgence in the past five years since treatment (Tables 4 and 19).

### **San Miguel Island**

Seasonal fluctuations in acorn barnacle cover were observed, but overall barnacle cover at most sites remained constant (Tables 7-10). In fall 1986, acorn barnacle levels decreased about 30 percent at Otter Harbor (Table 9). Even though barnacle cover increased in the spring 1987, it still remains below 1985 levels. At both the Otter Harbor and Harris Point sites, turfweed cover changed cyclically, with highest levels in the spring. All four San Miguel Island sites had high turfweed cover in spring 1987 (Tables 7-10). Crook Point continued to have only sparse rockweed cover (Table 10). Rockweed cover at both Crook Point and Harris Point declined over 40 percent in one year (Tables 8 and 10). Harris Point rockweed was virtually all *Hesperophycus harveyanus*, while *Pelvetia fastigiata*, was the predominant rockweed at Crook Point. Mussel cover at Crook Point declined slightly, but algal cover in the mussel zone increased (Table 10). Mussel cover at the other San Miguel sites remained constant.

### **Santa Barbara Island**

Acorn barnacle cover increased slightly over 1985 levels at both sites on Santa Barbara Island, while turfweed

cover at the Sea Lion Rookery site decreased slightly from the 1985 level (Tables 11 and 12). Rockweed cover at both sites decreased slightly from 1985 levels. At the Sea Lion Rookery site, the mussel cover increased (Table 12). Mussel cover in the two quadrats damaged by flotsam in 1985 at the Landing Cove site, was unchanged. A brown alga, *Egregia menziesii*, increased by over-growing the exposed rock (Table 11). *Egregia menziesii* also covers most of the rock exposed as a result of barge damage in 1985 to red algal turf quadrats at the Landing Cove site (Richards 1987). Nevertheless, the red algal turf cover has also increased in these quadrats, while retaining a high percent of cover in the other replicates.

### **Santa Rosa Island**

Acorn barnacle cover decreased about 35 percent from 1985 levels at Ford Point and Johnsons Lee (Tables 13 and 14). Both sites at East Point and Northwest had a high percent of barnacle cover (Tables 15 and 16). Turfweed cover increased in spring 1987 at all Santa Rosa Island sites, and is nearly twice the 1985 levels at Ford Point and Johnsons Lee (Tables 13-16). The sites on Santa Rosa Island had a heavy growth of *Pelvetia fastigiata* in the rockweed zone (Tables 15 and 16). Rockweed was absent from the southern exposure sites at Ford Point and Johnsons Lee, while mussel cover was stable at all sites.

### **ABALONE DATA**

During 1986, California Department of Fish and Game Biologists tagged 789 black abalone at San Miguel Island (271 at Otter Harbor, 518 at Harris

Point) and 1,231 at Santa Rosa Island (440 at Johnsons Lee, 311 at Ford Point, 480 at Northwest site). Additional abalone were tagged in 1987 at San Miguel Island, including 47 at Crook Point. These abalone were tagged near the monitoring plots, but not in them. Growth rates based on one year of data from San Miguel and Santa Rosa Islands indicate that black abalone may take up to 35 years to reach the legal harvestable size limit of 126mm (California Fish and Game Field Report 1987).

Abalone must be removed from the substrate for accurate measurement and tagging. Usually, abalone were not tagged in the monitoring plots to ensure minimal disturbance to the plots. However, in 1985 at Anacapa Island, abalone were tagged inside the plots to assess tagging procedures. Tagged abalone continued to be measured, but were not removed from rock, and as a result, were not used for growth studies. A search of the area revealed some abalone which had moved. The distance from the abalone to the nearest plot was measured. Abalone moved as much as three meters across sand channels in just two days. It appeared that tagging abalone, even with removal from rock did not adversely affect them. Many abalone were still in the same area after more than a year. Up to 38 percent of the tagged abalone were found in the same plots at Middle Anacapa Island 17 months after release.

Harris Point (San Miguel Island) was the only site to show a consistent increase in abalone since spring 1985

(Table 22). Otter Harbor and Harris Point (San Miguel Island) along with Sea Uon Rookery site (Santa Barbara Island) show minor but consistent seasonal cycles (Tables 22, 23 and 25). It is interesting to note that the cycles are opposite each other at the two islands, i.e. the San Miguel Island population has been larger in the fall, while at Santa Barbara Island the population increased in the spring. Black abalone numbers at most other sites have been decreasing steadily since the beginning of monitoring in spring 1985 (Tables 20-29).

#### Anacapa Island

At Cat Rock the total number of black abalone in the monitoring plots decreased each season, a total of 46 percent in the two years since monitoring began in 1985 (Table 20). In 1986, there was an increase in the percentage of juveniles in the population suggesting increased recruitment. Even with the increase in juveniles, the mean size of abalone in the plots still increased slightly.

Middle Anacapa Island black abalone also declined 41 percent in the monitoring plots in two years (Table 18). The percentage of juveniles in the population remained consistently high when compared to other sites. Nevertheless, mean sizes remained about the same.

#### San Miguel Island

Harris Point showed a 12 percent increase since 1985 (Table 22). The fall 1986 population was 46 percent larger than spring 1985 and 24 percent larger

than fall 1985. The population consistently increased in the fall and decreased in the spring. This site has a relatively high percentage of juveniles. There was an increase in the percentage of juveniles in the fall 1985 sample, while the mean size for the overall population decreased.

This successful juvenile recruitment was also apparent at the other San Miguel Island sites. The black abalone population at Otter Harbor declined 7 percent, but fluctuated by increasing in the fall and decreasing in the spring (Table 23). The mean size remained constant, but abalone at this site frequently had very worn shells, and are often oddly shaped because of limpet grazing.

The Crook Point abalone population decreased 42 percent with most of the decrease in the fall, opposite the pattern observed at Otter Harbor (Table 24). The overall mean size changed little. Black abalone are also present at Cuyler Harbor, but not in large numbers, and are not monitored.

### **Santa Barbara Island**

The Sea Lion Rookery site population has fluctuated consistently with greater numbers in the spring. The largest juvenile percentage was seen in the initial sampling in Spring 1985 (Table 25). Overall there was an increase in the population mean size of over 10mm. Black abalone are also present at the Landing Cove in very small numbers, but not monitored.

### **Santa Rosa Island**

The number of black abalone at Ford Point decreased, 65 percent since December 1985 and March 1987 (Table 27). Most of the decline occurred in four months between November 1986 and March 1987. While searching for tagged abalone during the sampling in March 1987, many dead abalone and shells were found. Of the 34 shells measured, 11 still had the dead animal attached. The shells ranged from 65-149mm and averaged over 123mm. Only three of these were tagged. There was some sand deposition around the abalone and four of the shells were broken, but no other cause of this mortality was evident. Many vacant home scars were observed on the rock at this time. In 1986, the percentage of juveniles was high. While the percentage of legally harvestable adults at Ford Point decreased in most plots in 1986; substantial increases were observed in spring 1987. The mean sizes in each quadrat remained about the same, until spring 1987 when the mean size increased approximately five percent.

Johnsons Lee maintained a relatively constant population with slight increases in 1986, but a decrease of 11 percent was noted in the first three months of 1987 (Table 26). The mean population size decreased only a few millimeters.

The monitoring sites at Northwest and East Point were just established in the fall of 1986. Both sites have significant black abalone populations. The Northwest site had a four percent increase in 1987, while East Point site had

a three percent increase (Tables and 29). The East Point site was greatly influenced by sand in the winter and spring of 1987. When the site was visited in March 1987, abalone were found partially and completely buried by sand, but still attached firmly to the rock. A very brief observation in June 1987, indicated that most of the abalone had crawled higher up the rock and out of the sand.

## OBSERVATIONS

Floating tar from natural oil seeps and human activity in the Santa Barbara Channel affected all of the sites, though in varying degrees. The most significantly affected sites were Harris Point, and to a lesser degree, Otter Harbor on San Miguel Island. Thick mats of tar covered rock in areas of Harris Point. The most noticeable effects at most sites were small tar patches on the rock. The tar seemed to persist only in the higher zones. Tar covered abalone and mussels observed at Otter Harbor in 1986 were clean the following sampling period. When the tar persisted, the covered organisms were usually killed. Occasionally, acorn barnacles were observed growing on tar, but only in small numbers. I have never observed algae growing on tar. The thick tar on the beach at Middle Anacapa Island in 1985, has not occurred since, and from casual observations, appeared to have caused no long-term damage.

Approximately one to five percent of all photoquadrat comers needed replacement in 1986. Ford Point (Santa Rosa Island) required the most maintenance with nearly 10 percent of the comers lost as a result of eroding

sandstone. Direct over-growth of the comers is not a major problem at most sites. Comers may be obscured but not completely covered between sampling periods. The Landing Cove site (Santa Barbara Island) had quadrat comers completely overgrown in the red algal turf zone. Sand burial caused problems locating quadrats at the East Point site (Santa Rosa Island).

The East Point site (Santa Rosa Island) **had marked sand influence** during spring 1987. Rockweed tops were all that showed through the sand with rock buried under 50-75mm of sand. Turfweed was also partially, but not completely, buried by sand. Some of the barnacle quadrats were buried, while others had little or no sand cover. Mussels along with limpets, black abalone, and various algae were completely buried under sand. Large green anemones, *Anthopleura elegantissima* extended several centimeters through the sand from their rock base to avoid burial.

West Anacapa Island was inspected near the end of a series of mid-day low tides during the spring of 1987. At several sites, patches of bleached-out red algal turf, *Gigartina canaliculata*, were observed.

Qualitative observations indicated that the sea star, *Pisaster ochraceus*, is becoming more abundant after a population low following the El Nino of 1982 and 1983. The general alga cover appears very healthy and more species continue to be found. The beach isopod, *Ligia occidentalis*, was common at many of the

sites on the northern islands in 1986. The owl limpet, *Lottia gigantea*, was also abundant at many of the sites, especially, Ford Point and Johnsons Lee (Santa Rosa Island).

The lower limits of the mussel beds were very distinct at some sites, particularly Johnsons Lee (Santa Rosa Island) and Crook Point (San Miguel Island) where the sea star *Pisaster ochraceus* was abundant. The sea stars were observed at, but not above the lower limit of the mussels. The lower limit of surf grass, *Phyllospadix* spp., corresponded with the upper limit of purple sea urchins, *Strongylocentrotus purpuratus*, at Otter Harbor (San Miguel Island).

Two algae of note, due to their usual northern distribution (Abbott and Hollenberg 1976), were found during the spring 1987 sampling. *Analipus japonicus* was found at Crook Point (San Miguel Island) and *Rhodomela larix* was collected from the Northwest Talcott site (Santa Rosa Island).

## DISCUSSION

The degree of black abalone decline at sites on the three northern islands is alarming. Explaining the decline is more difficult than detecting it. If legal fishery harvest were to blame, then a decrease in legal sizes only would be expected but all size classes were affected. The possibility exists that abalone harvested offshore are replaced by intertidal animals of various sizes. Although, observations indicate that offshore stocks are probably not as significant as the intertidal stocks. The

black abalone populations at Anacapa Island declined even where abalone were protected by fishing regulations. It is noteworthy, that the declines at Ford Point and Johnsons Lee during the winter 1987 did not occur at the other two Santa Rosa Island sites. Sand deposition could be a factor, but sand movement is a common occurrence at many sites around the islands and the abalone are probably well adapted to some influx. Natural cyclic fluctuations are a possibility that must also be considered. Another hypothesis is that a decrease in drift kelp, upon which abalone feed, is responsible. Since the El Nino of 1982-1983, kelp cover has been low; this could be attributed to a multiplicity of factors including storms, warm water, and sea urchin grazing. Observations of tagged abalone and seasonal population fluctuations at some sites indicate there was considerable movement within the population. More research needs to be done on population movements within the intertidal zone. Other considerations for future study with intertidal abalone include determining growth rates of juvenile and small abalone.

Often black abalone monitoring quadrats were established in areas where cracks could be avoided. This is problematic in that juvenile black abalone are usually found under rocks and in cracks and crevices. To better understand population dynamics more information must be obtained on recruitment and juvenile mortality.

The owl limpet, *Lottia gigantea*, and the ochre seastar, *Pisaster ochraceus*,

should be incorporated into the monitoring program. The owl limpet is a large grazer that can dominate much space in the intertidal community and is sometimes harvested. The ochre star is a major predator in the intertidal community.

Comprehensive species lists should be compiled after major disturbances such as the El Nino of 1982-1983, but preferably on an annual basis. Bureau of Land Management studies recorded 414 taxa: 197 macrophytes, and 217 macro invertebrates from 12 sites, with most sites having less than 200 taxa (Lippincott et al. 1977). Through cluster analysis this information can better illustrate the relationships that exist among and between the island ecosystems. In the Bureau of Land Management studies, the northern islands of San Miguel, Santa Rosa, and Santa Cruz were grouped together with San Nicolas Island. Santa Barbara Island was not grouped with any other park island, because it more closely approximated Santa Catalina Island, San Clemente Island and the southern mainland sites at Corona Del Mar and Ocean Beach (Lippincott et al. 1977). An Anacapa Island site was not included in this study.

Species lists could help quantify data from the photoquadrats. The permanent photoquadrats, have limitations: species identification can be difficult; some points are unidentifiable because of heavy shadows or other problems; the ability to measure layering is lost and 100 percent cover becomes the maximum; occasionally a data set is not retained when a slide is damaged or lost during

developing. A comparison of in situ point contact sampling and photoquadrats for percent cover determinations was made by Hardin et al., (1986). The authors concluded that photoquadrats underestimated species diversity and percent cover in layered communities, but photoquadrats worked well in two dimensional zones. For example, the turfweed zone, which had less layering, showed the least difference and the \* highly layered mussel zone showed the most difference between the two methods. Photoquadrats have distinct advantages in that less field time is required, and a permanent record is made of the quadrat. Monitoring only the dominant species, and choosing homogeneous quadrats also lessens the problems associated with photoquadrat sampling.

The lack of rockweed and mussel cover in the experimentally scraped quadrats at Cat Rock (Anacapa Island) gives insight into the amount of time required for recovery of some organisms in intertidal communities. Recruitment of rockweed into the acorn barnacle quadrats, particularly the experimentally scraped plots, showed that the intertidal zone is very dynamic and highly variable. The heavy growth of *Egregia* and other brown algae in plots cleared accidentally at the Landing Cove site on Santa Barbara Island (Richards 1987) illustrates a pattern that is very different from what exists at Cat Rock, where experimental quadrats have remained barren.

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Table 1. Abundance of index species, tar and bare rock expressed as percent cover at South Frenchys Cove, Anacapa Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
BARE ROCK												
Mean	59	56	43	59	48	42	13	11	17	18	13	17
Standard Deviation	8	12	7	10	16	22	15	8	14	13	7	10
ACORN BARNACLE												
Mean	37	40	53	11	10	12	< 1	0	0	2	2	2
Standard Deviation	7	11	9	9	7	8	< 1	0	0	2	2	2
TURFWEED												
Mean	1	3	4	19	37	42	1	< 1	1	3	0	1
Standard Deviation	1	4	4	11	17	20	1	1	1	3	0	1
ROCKWEED												
Mean	0	0	0	4	3	2	83	86	82	0	0	0
Standard Deviation	0	0	0	4	4	3	15	8	14	0	0	0
MUSSEL												
Mean	0	0	0	0	0	0	0	0	0	53	49	63
Standard Deviation	0	0	0	0	0	0	0	0	0	17	24	18
<u>MISCELLANEOUS ALGAE</u>												
Mean	< 1	< 1	0	7	2	1	3	2	< 1	24	36	17
Standard Deviation	1	0	0	7	3	1	2	3	< 1	28	25	27
MISCELLANEOUS ANIMAL												
Mean	1	0	< 1	< 1	0	0	0	< 1	0	0	0	0
Standard Deviation	3	0	1	< 1	0	0	0	1	0	0	0	0
TAR												
Mean	2	1	< 1	0	< 1	1	0	0	0	0	0	0
Standard Deviation	2	2	1	0	< 1	1	0	0	0	0	0	0
TOTAL POINTS												
	500	500	400	500	500	500	500	500	500	500	500	500

Table 2. Abundance of index species, tar and bare rock expressed as percent cover at Cat Rock, Anacapa Island (Control Quadrats)

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
<b>BARE ROCK</b>												
Mean	54	56	55	60	42	47	30	20	30	39	31	37
Standard Deviation	7	15	13	8	7	1	14	13	14	12	14	11
<b>ACORN BARNACLE</b>												
Mean	33	21	27	13	13	18	6	3	5	16	13	17
Standard Deviation	9	6	7	2	5	8	6	1	1	2	7	5
<b>TURFWEED</b>												
Mean	2	7	6	21	33	32	3	4	4	< 1	< 1	0
Standard Deviation	2	10	7	7	17	11	2	3	4	1	1	0
<b>ROCKWEED</b>												
Mean	11	16	12	4	2	1	62	69	60	0	0	0
Standard Deviation	14	19	16	3	4	2	17	11	15	0	0	0
<b>MUSSEL</b>												
Mean	0	0	0	0	2	< 1	0	0	0	38	41	42
Standard Deviation	0	0	0	0	2	1	0	0	0	6	12	12
<b>MISCELLANEOUS ALGAE</b>												
Mean	0	0	0	< 1	8	< 1	0	3		4	14	3
Standard Deviation	0	0	0	1	9	1	0	3	1	7	4	1
<b>MISCELLANEOUS ANIMAL</b>												
Mean	0	0	0	1	1	0	0	0	0	2	1	1
Standard Deviation	0	0	0	1	1	0	0	0	0	2	1	1
<b>TAR</b>												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL POINTS</b>												
	300	300	300	300	297	300	300	300	300		300	300

Table 3. Abundance of index species, tar and bare rock expressed as percent cover at Cat Rock, Anacapa Island (Trampled Quadrats)

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	-1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
BARE R04CK												
Mean	48	51	52	48	39	45	54	48	46	39	27	41
Standard Deviation	5	4	4	10	19	16	8	14	12	11	22	31
ACORN BARNACLE												
Mean	46	48	44	20	12	19	17	16	24	24	16	15
Standard Deviation	3	3	8	5	5	9	15	14	19	5	10	1
TURFWEED												
Mean	0	1	1	25	39	29	1	5	4	2	2	2
Standard Deviation	0	1	1	10	16	9	2	3	4	1	3	2
ROCKWEED												
Mean	3	0	3	0	0	0	27	29	25	0	0	0
Standard Deviation	6	1	6	0	0	0	22	29	26	0	0	0
MUSSEL												
Mean	0	0	0	1	2	1	0	0	0	32	33	34
Standard Deviation	0	0	0	2	3	1	0	0	0	15	13	26
MISCELLANEOUS ALGAE												
Mean	1	0	0	5	8	5	0	2	0	1	21	7
Standard Deviation	2	0	0	4	8	6	0	3	0	1	13	10
MISCELLANEOUS ANIMAL												
Mean	0	0	0	< 1	0	2	< 1	< 1	1	3	1	1
Standard Deviation	0	0	0	1	0	1	1	1	1	1	2	1
TAR												
Mean	1	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	2	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	300	300	300	300	300	300	299	300	300	300	296	200

Table 4. Abundance of index species, tar and bare rock expressed as percent cover at Cat Rock, Anacapa Island (Scraped Quadrats)

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
<b>BARE ROCK</b>												
Mean	35	24	30	61	56	61	52	56	39	40	46	55
Standard Deviation	3	5	10	23	16	16	12	12	8	1	6	4
<b>ACORN BARNACLE</b>												
Mean	41	41	38	20	8	19	37	25	47	26	14	29
Standard Deviation	24	24	18	3	1	3	7	8	6	9	8	2
<b>TURFWEED</b>												
Mean	1	6	4	15	26	19	3	8	8	1	2	2
Standard Deviation	2	4	5	14	26	20	2	4	4	1	2	2
<b>ROCKWEED</b>												
Mean	21	29	27	2	0	0	5	5	6	0	0	0
Standard Deviation	20	25	24	3	0	0	5	5	5	0	0	0
<b>MUSSEL</b>												
Mean	0	0	0	0	0	< 1	0	0	0	5	3	13
Standard Deviation	0	0	0	0	0	1	0	0	0	2	5	7
<b>MISCELLANEOUS ALGAE</b>												
Mean	2	0	< 1	1	10	0	2	6	0	26	33	0
Standard Deviation	3	0	1	2	10	0	3	8	0	10	8	0
<b>MISCELLANEOUS ANIMAL</b>												
Mean	0	0	0	1	<1	<1	< 1	0	0	2	2	1
Standard Deviation	0	0	0	1	1	1	1	0	0	1	2	0
<b>TAR</b>												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
<b>TOTAL POINTS</b>												
	300	300	300	300	300	299	299	300	300	300	300	300

Table 5. Abundance of index species, tar and bare rock expressed as percent cover at East Middle Anacapa Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
<b>BARE ROCK</b>												
Mean	67	64	66	41	31	32	19	4	23	19	11	11
Standard Deviation	17	16	23	3	5	10	3	2	6	11	6	5
AUUKN BARNACLE												
Mean	16	21	19	4	6	6	1	< 1	2	5	5	7
Standard Deviation	7	9	8	4	5	5	1	1	2	4	6	6
TU RFWEED												
Mean	14	10	9	35	41	46	3	1	4	0	0	0
Standard Deviation	6	6	6	9	11	13	4	2	4	0	0	0
<b>ROCKWEED</b>												
Mean	0	0	0	15	14	9	67	91	63	0	0	0
Standard Deviation	0	0	0	9	3	4	12	4	9	0	0	0
MUSSEL												
Mean	0	0	0	4	1	1	2	0	< 1	74	56	64
Standard Deviation	0	0	0	6	2	2	2	0	1	8	18	12
MISCELLANEOUS ALGAE												
Mean	3	4	6	1	7	6	8	3	6	1	27	17
Standard Deviation	4	4	10	2	4	5	7	2	6	2	16	4
MISCELLANEOUS ANIMAL												
Mean	0	0	0	0	0	0	0	<1	1	1	1	2
Standard Deviation	0	0	0	0	0	0	0	1	1	2	2	2
TAR												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	300	300	300	300	300	300	297	300	300	300	300	300

Table 6. Abundance of index species, Tar and bare rock expressed as percent cover at West Middle Anacapa Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr	Mar	Dec	Apr
BARE ROCK												
Mean	47	42	36	55	46	35	27	16	24	26	19	16
Standard Deviation	17	10	16	9	17	15	9	5	7	13	10	13
ACORN BARNACLE												
Mean	20	24	19	12	14	18	3	3	8	8	7	8
Standard Deviation	6	6	11	10	10	14	3	3	5	6	6	5
TURFWEED												
Mean	12	16	21	22	26	30	1	3	3	1	0	< 1
Standard Deviation	7	8	10	7	4	11	2	4	3	2	0	1
ROCKWEED												
Mean	0	0	0	0	0	< 1	57	64	54	0	0	0
Standard Deviation	0	0	0	0	0	< 1	24	23	27	0	0	0
MUSSEL												
Mean	< 1	1	1	0 < 1		1	0 < 1		1	57	52	60
Standard Deviation	< 1	2	1	0 < 1		2	0 < 1		1	18	18	17
MISCELLANEOUS ALGAE												
Mean	19	18	24	9	13	14	11	13	11	6	21	15
Standard Deviation	19	17	21	8	13	13	18	21	19	5	16	15
MISCELLANEOUS ANIMAL												
Mean	1	0	0	2 < 1		1	1	< 1	1	2	1	1
Standard Deviation	1	0	0	3 < 1		2	1	< 1	1	2	1	1
TAR												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	497	499	500	498	500	499	498	500	500	500	500	500

Table 7. Abundance of index species, tar and bare rock expressed as percent cover at Cuyler Harbor, San Miguel island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Dec	Mar	Mar	Dec	Mar	Mar	Dec	Mar	Mar	Dec	Mar
<b>BARE ROCK</b>												
Mean	54	58	48	48	49	32	19	11	20	9	10	10
Standard Deviation	10	10	8	14	15	12	10	6	11	7	9	7
<b>ACORN BARNACLE</b>												
Mean	40	36	39	8	7	5	<1	0	0	1		0
Standard Deviation	16	16	17	13	13	3	<1	0	0	2		0
<b>TURFWEED</b>												
Mean	5	6	11	40	38	59	2	2	3	0	0	<1
Standard Deviation	6	7	12	9	8	13	5	4	5	0	0	<1
<b>ROCKWEED</b>												
Mean	0	0	0	<1	<1	0	71	85	74	0	0	0
Standard Deviation	0	0	0	<1	1	0	14	9	16	0	0	0
<b>MUSSEL</b>												
Mean	0	0	0	2	2	2	1	0	<1	85	84	85
Standard Deviation	0	0	0	4	4	4	1	0	1	10	12	9
<b>MISCELLANEOUS ALGAE</b>												
Mean	0	<1	0	1	1	1	4	<1	1	<1	5	2
Standard Deviation	0	<1	0	1	2	1	3	1	2	<1	5	2
<b>MISCELLANEOUS ANIMAL</b>												
Mean	<1	<1	<1	<1	1		2	2		5	1	3
Standard Deviation	<1	<1	1	<1	1		5	3		3	1	4
<b>TAR</b>												
Mean	0	<1	1	0	2	<1	<1	0	0	0	0	0
Standard Deviation	0	<1	1	0	2	<1	<1	0	0	0	0	0
<b>TOTAL POINTS</b>												
	498	500	500	500	500	500	500	500	500	500	500	500

Table 8. Abundance of index species, tar and bare rock expressed as percent cover at Harris Point, San Miguel Island

	BARNACLE			TURFWEED			ROCKWEED					
	1986	1987		1986	1987		1986	1987		1986	1987	
	Mar	Nov	Mar	Mar	Nov	Mar	Mar	Nov	Mar	Mar	Nov	Mar
BARE ROCK												
Mean	36	36	30	36	53	19	14	31	34	16	15	16
Standard Deviation	17	26	14	15	17	12	4	13	17	8	7	7
ACORN BARNACLE												
Mean	53	41	56	0	4	3	0	0	1	1	1	0
Standard Deviation	IS	20	14	0	4	2	0	0	1	1	2	0
TURFWEED												
Mean	1	<1	<1	55	28	65	9	7	25	<1	0	1
Standard Deviation	1	<1	<1	15	7	13	7	7	15	<1	0	1
ROCKWEED												
Mean	0	0	0	6	11	10	75	60	39	0	0	0
Standard Deviation	0	0	0	5	14	11	9	16	13	0	0	0
<u>MUSSEL</u>												
Mean -	8	11	13	1	<1	2	<1	0	<1	81	76	81
Standard Deviation	9	12	13	3	1	5	<1	0	<1	10	9	9
MISCELLANEOUS ALGAE												
Mean	1	7	0	2			2	1	1	1	6	1
Standard Deviation	2	9	0	2			4	2	1	1	4	1
MISCELLANEOUS ANIMAL												
Mean	1	4	2	<1	<1	<1	0	<1	0	0	1	1
Standard Deviation	1	3	2	1	1	<1	0	1	0	0	2	1
TAR												
Mean	0	0	0	0	1	<1	0	0	0	0	0	0
Standard Deviation	0	0	0	0	2	1	0	0	0	0	0	0
TOTAL POINTS												
	500	500	496	500	500	498	500	500	500	500	500	498

Table 9. Abundance of index species, tar and bare rock expressed as percent cover at Otter Harbor, San Miguel island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Nov	Mar	Mar	Nov	Mar	Mar	Nov	Mar	Mar	Nov	Mar
BARE ROCK												
Mean	46	57	51	13	26	16	4	4	12	25	21	26
Standard Deviation	13	13	22	5	13	11	4	3	7	4	7	5
ACORN BARNACLE												
Mean	49	34	41	< 1	< 1	0	0	0	< 1	3	2	3
Standard Deviation	7	15	14	1	1	0	0	0	< 1	4	4	5
TURFWEED												
Mean	< 1	0	0	72	58	71	5	3	5	0	< 1	0
Standard Deviation	< 1	0	0	9	10	9	4	2	6	0	< 1	0
ROCKWEED												
Mean	0	0	0	6	8	6	85	93	77	0	0	0
Standard Deviation	0	0	0	7	8	6	5	5	9	0	0	0
MUSSEL												
Mean	0	0	0	0	< 1		0	0	0	61	60	57
Standard Deviation	0	0	0	0	< 1	1	0	0	0	6	10	8
MISCELLANEOUS ALGAE												
Mean	1	4	5	8	7	7	6	1	5	6	12	8
Standard Deviation	1	9	9	6	5	7	4	1	5	4	9	9
MISCELLANEOUS ANIMAL												
Mean	< 1	1		0	0	0	0	0	0	5	4	6
Standard Deviation	< 1	2		0	0	0	0	0	0	4	5	6
TAR												
Mean	3	4	2	0	0	< 1	0	0	0	0	0	0
Standard Deviation	7	7	3	0	0	< 1	0	0	0	0	0	0
<b>TOTAL POINTS</b>												
	500	500	495	500	500	499	500	500	500	500	500	500

Table 10. Abundance of index species, tar and bare rock expressed as percent cover at Crook Point, San Miguel Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Mar	Oct	Mar	Mar	Oct	Mar	Mar	Oct	Mar	Mar	Oct	Mar
BARE ROCK												
Mean	59	65	57	50	44	43	55	58	57	15	17	15
Standard Deviation	16	16	19	7	8	15	17	18	12	8	7	6
ACORN BARNACLE												
Mean	36	33	31	5	4	3	5	3	5	6	3	3
Standard Deviation	17	16	12	5	5	2	4	3	5	9	2	3
TURFWEED												
Mean	2	1	2	33	37	47	9	11	13	< 1		
Standard Deviation	2	1	4	13	11	19	10	15	17	1		
ROCKWEED												
Mean	0	0	0	1	1	1	16	14	9	0	0	0
Standard Deviation	0	0	0	2	3	2	9	7	3	0	0	0
MUSSEL												
Mean	0 < 1		0	3	2	2	6	7	7	65	62	
Standard Deviation	0 < 1		0	6	4	4	8	9	10	7	11	
MISCELLANEOUS ALGAE												
Mean	4	1	10	3	9	3	8	6	3	10	17	7
Standard Deviation	7	2	21	5	9	5	8	7	5	10	17	5
MISCELLANEOUS ANIMAL												
Mean	0	0	< 1	4	3	2						
Standard Deviation	0	0	< 1	6	3	2			4	4	1	4
									3	3	2	4
TAR												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	500	500	500	500	500	500	500	500	500	500	500	500

Table 11. Abundance of index species, tar and bare rock expressed as percent cover at Landing Cove site, Santa Barbara Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Apr		Dec	Apr	Apr		Dec	Apr		Apr		Dec
BAREROCK												
Mean	53	65	49	< 1	1	0	24	12	15	10	3	5
Standard Deviation	6	6	11	< 1	2	0	3	11	8	7	3	3
ACORN BARNACLE												
Mean	34	26	40	0	0	0	1	1	3	4	6	1
Standard Deviation	12	9	5	0	0	0	2	1	3	6	6	1
TURFWEED												
Mean	6	2	6	0	0	0	1	<1	3	0	0	0
Standard Deviation	8	3	6	0	0	0	3	1	3	0	0	0
ROCKWEED												
Mean	0	0	0	0	0	0	67	64	61	0	0	0
Standard Deviation	0	0	0	0	0	0	5	14	7	0	0	0
MUSSEL												
Mean	0	0	0	68	64	62	0	0	1	61	55	62
Standard Deviation	0	0	0	44	47	50	0	0	1	29	24	25
MISCELLANEOUS ALGAE												
Mean	7	7	5									
Standard Deviation	7	6	7	32	34	38	6	23	16	22	32	30
				44	47	50	7	12	7	26	28	29
MISCELLANEOUS ANIMAL												
Mean	0	0	0	0	0	0	0	0		4	3	2
Standard Deviation	0	0	0	0	0	0	0	0		5	3	3
TAR												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	500	500	499	500	500	500	500	500	500	500	500	500

Table 12. Abundance of index species, tar and bare rock expressed as percent cover at Sea Lion Rookery site, Santa Barbara Island

	BARNACLE			TURFWEED			ROCKWEED			MUSSEL		
	1986		1987	1986		1987	1986		1987	1986		1987
	Apr	Dec	Apr	Apr	Dec	Apr	Apr	Dec	Apr	Apr	Dec	Apr
BARE ROCK												
Mean	62	56	53	42	33	35	19	4	27	3	3	2
Standard Deviation	12	13	14	5	3	10	8	3	15	2	2	2
ACORN BARNACLE												
Mean	33	28	28	22	10	19	4	<1	9	41	25	16
Standard Deviation	11	5	8	9	3	9	3	<1	5	8	10	7
TURFWEED												
Mean	5	0	3	26	41	38	4	3	5	<1	0	0
Standard Deviation	6	0	5	10	9	7	4	4	4	<1	0	0
ROCKWEED												
Mean	0	0	0	4	5	3	64	85	55	0	0	0
Standard Deviation	0	0	0	6	8	5	9	12	15	0	0	0
MUSSEL												
Mean	0	0	0	<1	<1	<1	<1	<1	0	49	63	74
Standard Deviation	0	0	0	1	1	<1	<1	<1	0	6	6	7
MISCELLANEOUS ALGAE												
Mean	1	16	16	7	10	3	9	8	5	0	2	<1
Standard Deviation	1	9	10	7	7	2	8	7	1	0	3	1
MISCELLANEOUS ANIMAL												
Mean	<1	0	0	0	<1	<1	0	0	0	6	8	8
Standard Deviation	<1	0	0	0	<1	1	0	0	0	5	6	4
TAR												
Mean	0	0	0	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL POINTS												
	500	500	500	500	500	500	492	500	500	500	499	500

Table 13. Abundance of index species, tar and bare rock expressed as percent cover at Johnsons Lee, Santa Rosa Island

	BARNACLE			TURFWEED			MUSSEL		
	1986			1987			1986		
	Apr	Nov	Mar	Apl	Nov	Mar	Apr	Nov	Mar
<b>BARE ROCK</b>									
Mean	63	61	63	59	51	44	13	15	15
Standard Deviation	7	11	16	7	10	12	6	10	10
<b>ACORN BARNACLE</b>									
Mean	45	35	34	4	4	2	2	1	1
Standard Deviation	8	15	19	4	4	4	1	1	2
<b>TURFWEED</b>									
Mean	1	1	1	28	34	45	0	0	0
Standard Deviation	1	2	2	10	16	19	0	0	0
<b>KUU&amp;WEEV</b>									
Mean	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0
<b>MUSSEL</b>									
Mean	0 < 1		0	8	7	7	71	69	78
Standard Deviation	0 < 1		0	9	7	9	13	18	13
<b>MISCELLANEOUS ALGAE</b>									
Mean	0	1	1	0	2	1	1	3	< 1
Standard Deviation	0	3	2	0	2	1	2	4	1
<b>MISCELLANEOUS ANIMAL</b>									
Mean	1	1	1	< 1	2	1	13	13	6
Standard Deviation	2	3	2	1	2	1	13	16	8
<b>TAR</b>									
Mean	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0
<b>TOTAL POININ</b>									
	500	500	500	500	500	500	600	500	500

Table 14. Abundance of index species, tar and bare rock expressed as percent cover at Ford Point, Santa Rosa Island

	BARNACLE			TURFWEED			WUSSEL		
	1986		1987	1986		1987	1986		1987
	Apr	Nov	Mar	Apr	Nov	Mar	Apr	Nov	Mar
<b>BARE ROCK</b>									
Mean	67	67	68	54	43	41	24	28	31
Standard Deviation	13	17	17	15	13	10	16	14	15
<b>ACORN BARNACLE</b>									
Mean	32	30	30	3	2	< 1	3	1	1
Standard Deviation	12	17	18	2	2	1	3	1	1
<b>TURFWEED</b>									
Mean	0	<1	<1	36	34	44	1		0
Standard Deviation	0	<1	1	17	12	14	2		0
<b>ROCKWEED</b>									
Mean	0	0	0	0	0	0	0	<1	0
Standard Deviation	0	0	0	0	0	0	0	< 1	0
<b>MUSSEL</b>									
Mean	0	0	0	4	6	5	70	62	62
Standard Deviation	0	0	0	4	3	5	20	14	16
<b>MISCELLANEOUS ALGAE</b>									
Mean	1	< 1	0	3	15	6	1	6	4
Standard Deviation	1	< 1	0	5	6	4	1	3	3
<b>MISCELLANEOUS ANIMAL</b>									
Mean	0	3	1	0	<1	2	2	2	2
Standard Deviation	0	2	3	0	< 1	2	1	2	1
<b>TAR</b>									
Mean	0	0	0	0	0	0	0	0	0
Standard Deviation	0	0	0	0	0	0	0	0	0
<b>TOTAL POINTS</b>									
	398	500	500	400	500	500	500	500	500

Table 15. Abundance of index species, tar and bare rock expressed as percent cover at Northwest site, Santa Rosa Island

	BARNACLE		TURFWEED		ROCKWEED		MUSSEL	
	1986 Nov	1987 Jun	1986 Nov	1987 Jun	1986 Nov	1987 Jun	1986 Nov	1987 Jun
<b>BARE ROCK</b>								
Mean	37	31	49	39	12	19	20	22
Standard Deviation	15	18	12	14	10	12	11	9
<b>ACORN BARNACLE</b>								
Mean	60	67	6	11	1	1	2	2
Standard Deviation	15	17	5	10	1	2	2	3
<b>TURFWEED</b>								
Mean	< 1	1	35	45	2	4	0	< 1
Standard Deviation	1	1	8	9	2	3	0	< 1
<b>ROCKWEED</b>								
Mean	0	0	0	0	85	76	0	0
Standard Deviation	0	0	0	0	11	14	0	0
<b>MUSSEL</b>								
Mean	<	0	< 1	< 1	0	0	71	66
Standard Deviation	<	0	1	< 1	0	0	17	17
<b>MISCELLANEOUS ALGAE</b>								
Mean	1	0		4	< 1	< 1	4	3
Standard Deviation	2	0		6	1	1	4	4
<b>MISCELLANEOUS ANEVIAL</b>								
Mean			< 1	< 1	0	0	3	7
Standard Deviation					0	0	2	3
<b>TAR</b>								
Mean	< 1	1	0	0	0	0	0	0
Standard Deviation	< 1	1	0	0	0	0	0	0
<b>TOTAL POINTS</b>								
	500	500	500	500	500	500	500	500

Table 16. Abundance of index species, tar and bare rock expressed as percent cover at East Point site, Santa Rosa Island

	BARNACLE		TUIRFWEED		ROCKWEED		MUSSEL	
	1986 Dec	1987 Mar	1986 Dec	1987 Mar	1986 Dec	1987 Mar	1986 Dec	1987 Mar
<u>BARE ROCK/SAND</u>								
Mean	41	30	13	22	2	6	8	9
Standard Deviation	15	44	6	29	3	11	2	10
<u>ACORN BARNACLE</u>								
Mean	56	69	14	1	0	0	0	0
Standard Deviation	14	33	9	1	0	0	0	0
<u>TURFWEED</u>								
Mean	< 1	1	68	74	0	0	<	
Standard Deviation	< 1	1	11	8	0	0	1	
<u>ROCKWEED</u>								
Mean	0	0	5	3	98	94	0	0
Standard Deviation	0	0	6	3	3	7	0	0
<u>MUSSEL</u>								
Mean	0	0	< 1	0	0	0	88	90
Standard Deviation	0	0	< 1	0	0	0	4	4
<u>MISCELLANEOUS ALGAE</u>								
Mean	2	0	0	0	0	<1	4	0
Standard Deviation	2	0	0	0	0	< 1	3	0
<u>MISCELLANEOUS ANIMAL</u>								
Mean	< 1	< 1	0	0	0	0	< 1	1
Standard Deviation	1	1	0	0	0	0	1	1
<u>TAR</u>								
Mean	< 1	1	0	0	0	0	0	0
Standard Deviation	1	1	0	0	0	0	0	0
<u>TOTAL POINTS</u>								
	500	500	500	500	500	500	500	500

Table 17. Abundance of index species, tar and bare rock expressed as percent cover at Cat Rock, Anacapa Island (Control) January 1982

	BARNACLE	TURFWEED	ROCKWEED	MUSSEL
BARE ROCK				
Mean	68	33	20	40
Standard Deviation	15	7	20	11
ACORN BARNACLE				
Mean	30	5	1	16
Standard Deviation	13	4	2	4
TURFWEED				
Mean	2	56	6	1
Standard Deviation	2	14	5	2
ROCKWEED				
Mean	0	5	73	0
Standard Deviation	0	9	17	0
MUSSEL				
Mean	0	0	0	39
Standard Deviation	0	0	0	7
MISCELLANEOUS ALGAE				
Mean	0	<1	0	0
Standard Deviation	0	1	0	0
MISCELLANEOUS ANIMAL				
Mean	0	0	0	3
Standard Deviation	0	0	0	5
TAR				
Mean	0	0	0	0
Standard Deviation	0	0	0	0
TOTAL POINTS				
	300	295	300	300

Table 18. Abundance of index species, tar and bare rock expressed as percent cover at Cat Rock, Anacapa island (Trampled Quadrats) January 1982 (pre-treatment)

	BARNACLE	TURFWEED	ROCKWEED	MUSSELL
BAREROCK				
Mean	55	31	10	41
Standard Deviation	6	4	5	8
ACORN BARNACLE				
Mean	41	24	1	11
Standard Deviation	2	6	1	2
TURFWEED				
Mean	4	41	5	2
Standard Deviation	6	5	4	4
ROCKWEED				
Mean	1	2	83	0
Standard Deviation	1	3	4	0
<u>fviLub6LL</u>				
Mean	0	0	0	32
Standard Deviation	0	0	0	19
MISCELLANEOUS ALGAE				
Mean	0	1	1	8
Standard Deviation	0	2	2	4
<u>MISCELLANEOUS ANIMAL</u>				
Mean	0	1	0	4
Standard Deviation	0	2	0	3
TAR				
Mean	0	0	0	0
Standard Deviation	0	0	0	0
TOTAL POINTS				
	300	300	300	297

Table 19. Abundance of index species, tar and bare rock expressed as percent cover at Cat

	BARNACIF	TURFWEED	ROCKWEED	MUSSEL
BARE ROCK				
Mean	64	36	12	46
Standard Deviation	12	14	6	8
ACORN BARNACLE				
Mean	36	12	3	19
Standard Deviation	12	14	12	8
TURFWEED				
Mean	0	49	4	2
Standard Deviation	0	17	5	0
ROCKWEED				
Mean	0	1	81	0
Standard Deviation	0	1	8	0
MUSSEL				
Mean	0	1	0	25
Standard Deviation	0	1	0	5
MISCELLANEOUS ALGAE				
Mean	0	2	0	6
Standard Deviation	0	3	0	7
MISCELLANEOUS ANIMAL				
Mean	0	0	0	1
Standard Deviation	0	0	0	1
TAR				
Mean	0	0	0	0
Standard Deviation	0	0	0	0
TOTAL POINTS				
	300	300	300	289

Table 20. Abundance and size distribution (percent) of black abalone (*Haliods cracherodil*) in fixed plots at Cat Rock, Anacapa Island

SPRING 1987	QUADRAT 305	QUADRAT 306	QUADRAT 307	QUADRAT 308	QUADRAT 309	STATION SUMMARY
TOTALABALONE	33	28	9	41	45	156
• Juveniles	0	0	0	0	0	0
• Non-Legal Adult	76	75	56	63	89	89
• Legal Adult	24	25	44	37	11	11
Mean Size (mm)	112	108	126	121	109	
Minimum Size (mm)	63	50	116	78	52	
Maximum Size (mm)	141	144	137	141	135	
<u>FALL 1986</u>						
TOTALABALONE	26	50	15	41	47	179
• Juveniles	15	2	7	0	0	0
• Non-Legal Adult	54	74	47	59	74	76
• Legal Adult	31	24	47	41	26	24
Mean Size (mm)	108	105	117	124	114	
Minimum Size (mm)	30	40	30	101	48	
Maximum Size (mm)	144	142	139	137	149	
<u>SPRING 1986</u>						
TOTALABALONE	55	31	24	37	51	198
• Juveniles	2	13	0	0	2	2
• Non-Legal Adult	78	68	54	68	86	87
• Legal Adult	20	19	46	32	12	11
Mean Size (mm)	105	100	120	120	109	
Minimum Size (mm)	43	32	69	85	41	
Maximum Size (mm)	143	143	138	140	149	
<u>FALL 1985</u>						
TOTALABALONE	74	44	31	48	60	257
• Juveniles	1	5	0	0	0	0
• Non-Legal Adult	84	73	58	69	87	84
• Legal Adult	15	23	42	31	13	16
Mean Size (mm)	107	104	119	119	114	
Minimum Size (mm)	40	39	77	52	90	
Maximum Size (mm)	143	141	145	146	136	
<u>SPRING 1985</u>						
TOTALABALONE	87	49	37	44	70	287
• Juveniles	5	14	0	0	1	2
• Non-Legal Adult	79	63	73	66	84	84
• Legal Adult	16	22	27	34	14	14
Mean Size (mm)	103	93	113	124	109	
Minimum Size (mm)	25	25	59	82	40	
Maximum Size (mm)	147	145	138	154	150	

Table 21. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodfi*) in fixed plots at Middle Anacapa Island

	QUADRAT 300	QUADRAT 301	QUADRAT 302	QUADRAT 303	QUADRAT 304	STATION SUMMARY
<u>SPRING 1987</u>						
TOTAL ABALONE	63	48	97	41	60	309
• Juveniles	13	0	7	2	17	14
• Non-Legal Adult	86	69	72	88	75	79
• Legal Adult	2	31	21	10	8	6
Mean Size (mm)	89	ill	101	103	85	
Minimum Size (mm)	20	52	30	35	30	
Maximum Size (mm)	141	138	144	136	143	
<u>FALL 1986</u>						
TOTAL ABALONE	102	53	113	60	76	404
% Juveniles	13	0	6	3	22	18
% Non-Legal Adult	82	66	77	88	67	72
% Legal Adult	5	34	17	8	11	11
Mean Size (mm)	87	113	102	102	81	
Minimum Size (mm)	14	52	28	38	20	
Maximum Size (mm)	134	140	167	137	144	
<u>SPRING 1986</u>						
TOTAL ABALONE	121	59	120	95	96	491
• Juveniles	19	8	10	6	20	22
• Non-Legal Adult	78	64	71	87	72	66
• Legal Adult	4	27	19	6	8	12
Mean Size (mm)	85	105	100	97	81	
Minimum Size (mm)	20	35	20	23	20	
Maximum Size (mm)	132	142	143	133	143	
<u>FALL 1985</u>						
TOTAL ABALONE	125	64	112	128	122	551
• Juveniles	15	3	5	9	15	14
• Non-Legal Adult	81	78	77	84	79	80
• Legal Adult	4	19	18	7	7	6
Mean Size (mm)	90	107	104	94	87	
Minimum Size (mm)	22	32	20	18	27	
Maximum Size (mm)	132	141	144	140	148	
<u>SPRING 1985</u>						
TOTAL ABALONE	123	69	108	106	121	527
% Juveniles	11	0	2	0	4	6
• Non-Legal Adult	84	59	77	91	88	87
• Legal Adult	5	41	21	9	7	7
Mean Size (mm)	88	118	106	101	94	
Minimum Size (mm)	20	60	24	49	25	
Maximum Size (mm)	133	150	148	133	138	

Table 22. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodfi*) in fixed plots at Harris Point, San Miguel Island

	QUADRAT 441	QUADRAT 442	QUADRAT 443	QUADRAT 444	QUADRAT 445	STATION SUMMARY
<u>SPRING 1987</u>						
<b>TOTAL ABALONE</b>	82	76	54	115	95	442
• Juveniles	16	8	7	6	16	13
• Non-Legal Adult	78	76	70	76	72	71
• Legal Adult	6	16	22	18	13	15
Mean Size (mm)	78	88	98	91	84	
Minimum Size (mm)	25	35	30	35	34	
Maximum Size (mm)	142	141	141	142	138	
<u>FALL 1986</u>						
TOTAL ABALONE	90	91	66	138	161	546
• Juveniles	13	1	6	8	11	11
• Non-Legal Adult	79	87	77	82	81	81
• Legal Adult	8	12	17	10	8	8
Mean Size (mm)	79	87	97	85	76	
Minimum Size (mm)	25	25	35	20	25	
Maximum Size (mm)	140	150	141	141	140	
<u>SPRING 1986</u>						
TOTAL ABALONE	88	94	48	90	77	399
• Juveniles	16	13	0	7	10	11
• Non-Legal Adult	81	69	75	77	73	72
• Legal Adult	3	18	25	17	17	17
Mean Size (mm)	77	86	108	93	96	
Minimum Size (mm)	25	25	44	23	15	
Maximum Size (mm)	140	140	141	144	141	
<u>FALL 1985</u>						
TOTAL ABALONE	93	106	71	84	88	442
• Juveniles	34	25	14	11	6	8
• Non-Legal Adult	54	71	70	71	84	83
• Legal Adult	12	5	15	18	10	9
Mean Size (mm)	77	76	87	94	91	
Minimum Size (mm)	is	15	20	18	30	
Maximum Size (mm)	146	140	143	148	143	
<u>SPRING 1995</u>						
TOTAL ABALONE	71	88	51	83	83	376
• Juveniles	7	1	2	6	2	2
• Non-Legal Adult	82	84	76	78	87	87
• Legal Adult	11	15	2-2	16	11	11
Mean Size (mm)	95	94	106	95	92	
Minimum Size (mm)	18	36	31	39	34	
Maximum Size (mm)	143	147	142	153	135	

Table 23. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodii*) in fixed plots at Otter Harbor, San Miguel Island

	QUADRAT 365	QUADRAT 366	QUADRAT 367	QUADRAT 368	QUADRAT 369	STATION SUMMARY
ING 1987						
TOTAL ABALONE	133	98	117	37	76	461
• Juveniles	0	0	1	0	0	0
• Non-Legal Adult	59	64	53	49	74	71
• Legal Adult	41	36	46	51	26	29
Mean Size (mm)	109	113	115	117	112	
Minimum Size (mm)	45	48	42	61	54	
Maximum Size (mm)	145	146	143	146	143	
FALL 1986						
TOTAL ABALONE	127	95	117	70	84	493
• Juveniles	3	1	0	0	1	2
• Non-Legal Adult	64	60	57	63	79	73
• Legal Adult	33	39	43	37	20	25
Mean Size (mm)	103	109	115	114	106	
Minimum Size (mm)	14	40	62	47	35	
Maximum Size (mm)	145	144	145	145	141	
SPRING 1986						
TOTAL ABALONE	104	111	96	62	86	459
• Juveniles	2	6	1	0	2	2
• Non-Legal Adult	51	54	46	52	67	63
• Legal Adult	47	40	53	48	30	35
Mean Size (mm)	133	109	120	118	109	
Minimum Size (mm)	39	25	43	52	35	
Maximum Size (mm)	148	146	145	147	144	
FALL 1985						
TOTAL ABALONE	163	100	102	79	100	544
• Juveniles	2	17	10	3	14	10
• Non-Legal Adult	60	58	64	71	63	61
• Legal Adult	38	25	26	27	23	29
Mean Size (mm)	106	94	105	113	97	
Minimum Size (mm)	35	15	30	21	18	
Maximum Size (mm)	161	149	168	144	160	
SPRING 1995						
TOTAL ABALONE	145	118	101	74	91	529
• Juveniles	6	1	0	0	5	8
• Non-Legal Adult	52	58	57	59	70	61
% Legal Adult	41	42	43	41	24	31
Mean Size (mm)	110	114	121	116	103	
Minimum Size (mm)	29	41	60	57	15	
Maximum Size (mm)	151	146	147	145	145	

Table 24. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodii*) in fixed plots at Crook Point, San Miguel Island

	QUADRAT QUADRAT QUADRAT QUADRAT QUADRAT STATION					
	391	392	393	394 . . 395		SUMMARY
<u>SPRING 1987</u>						
TOTAL ABALONE	44	38	33	84	64	263
• Juveniles	2	0	0	4	2	4
• Non-Legal Adult	61	50	61	92	91	90
• Legal Adult	36	50	40	5	8	6
Mean Size (mm)	108	118	118	95	93	
Minimum Size (mm)	28	47	49	40	40	
Maximum Size (mm)	142	150	150	139	140	
<u>FALL 1986</u>						
TOTALABALONE	45	49	31	95	74	294
• Juveniles	0	0	0	1	3	2
• Non-Legal Adult	60	55	55	93	85	87
• Legal Adult	40	45	45	6	12	11
Mean Size (mm)	119	117	123	97	100	
Minimum Size (mm)	67	64	95	24	37	
Maximum Size (mm)	144	148	144	136	140	
<u>SPRING 1986</u>						
TOTALABALONE	65	44	41	113	90	353
• Juveniles	0	0	0	4	0	0
• Non-Legal Adult	66	39	49	89	83	86
• Legal Adult	34	61	51	6	17	14
Mean Size (mm)	116	120	126	97	102	
Minimum Size (mm)	50	50	89	26	47	
Maximum Size (mm)	188	147	148	142	143	
<u>FALL 1985</u>						
TOTALABALONE	55	54	56	102	74	341
• Juveniles	0	11	4	1	0	0
• Non-Legal Adult	75	61	66	84	89	91
• Legal Adult	25	28	30	15	11	9
Mean Size (mm)	113	105	114	107	103	
Minimum Size (mm)	70	30	30	35	48	
Maximum Size (mm)	140	142	145	145	140	
<u>SPRING 1985</u>						
TOTALABALONE	69	66	61	140	119	455
% Juveniles	0	2	0	1	1	1
• Non-Legal Adult	55	67	49	92	88	89
• Legal Adult	45	32	51	7	11	9
Mean Size (mm)	121	115	125	101	96	
Minimum Size (mm)	55	42	68	36	38	
Maximum Size (mm)	157	149	154	137	147	

Table 25. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodii*) in fixed plots at Sea Lion Rookery site, Santa Barbara Island.

	QUADRAT 340	QUADRAT 341	QUADRAT 342	QUADRAT 343	QUADRAT 344	STATION SUMMARY
<u>SPRING 1987</u>						
TOTALABALONE	93	31	7	18	19	168
• Juveniles	0	0	0	0	0	0
• Non-Legal Adult	94	81	71	50	74	86
• Legal Adult	6	19	29	50	26	14
Mean Size (mm)	90	ill	114	121	119	
Minimum Size (mm)	44	44	98	59	96	
Maximum Size (mm)	180	153	129	140	140	
<u>FALL 1986</u>						
TOTALABALONE	76	25	19	15	20	155
• Juveniles	4	0	0	0	5	5
• Non-Legal Adult	96	84	95	67	70	87
• Legal Adult	0	16	5	33	25	8
Mean Size (mm)	91	109	110	112	112	
Minimum Size (mm)	37	55	86	45	32	
Maximum Size (mm)	126	151	131	140	148	
<u>SPRING 1986</u>						
TOTALABALONE	92	25	19	18	23	177
• Juveniles	1	0	0	0	0	1
• Non-Legal Adult	98	84	89	78	74	90
• Legal Adult	1	16	11	22	26	9
Mean Size (mm)	91	102	103	115	116	
Minimum Size (mm)	42	68	82	60	89	
Maximum Size (mm)	132	140	130	137	141	
<u>FALL 1995</u>						
TOTALABALONE	73	15	12	17	24	141
• Juveniles	0	0	0	0	0	0
• Non-Legal Adult	97	87	75	76	79	90
• Legal Adult	3	13	25	24	21	10
Mean Size (mm)	92	109	106	115	ill	
Minimum Size (mm)	45	65	65	80	56	
Maximum Size (mm)	135	138	140	137	152	
<u>SPRING 1985</u>						
TOTALABALONE	69	22	30	22	27	170
% Juveniles	4	0	37	5	4	6
• Non-Legal Adult	96	73	47	68	70	83
• Legal Adult	0	27	17	27	26	12
Mean Size (mm)	89	101	77	102	113	
Minimum Size (mm)	25	56	14	22	23	
Maximum Size (mm)	125	142	143	138	154	

Table 26. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodii*) in fixed plots at Johnsons Lee, Santa Rosa Island

	QUADRAT 515	QUADRAT 516	QUADRAT 517	QUADRAT 518	QUADRAT 519	STATION SUMMARY
<u>SPRING 1987</u>						
TOTAL ABALONE	66	75	56	116	20	333
% Juveniles	3	3	2	2	15	4
% Non-Legal Adult	83	72	59	55	80	60
% Legal Adult	14	25	39	43	5	35
Mean Size (mm)	107	109	117	116	95	
Minimum Size (mm)	37	28	40	35	25	
Maximum Size (mm)	139	144	141	142	140	
<u>FALL 1986</u>						
TOTAL ABALONE	78	68	66	139	23	374
% Juveniles	0	1	8	3	9	4
% Non-Legal Adult	85	78	62	61	78	62
% Legal Adult	15	21	30	36	13	34
Mean Size (mm)	107	110	111	114	107	
Minimum Size (mm)	49	33	30	25	29	
Maximum Size (mm)	141	145	144	143	140	
<u>SPRING 1986</u>						
TOTAL ABALONE	92	73	78	149	27	419
• Juveniles	1	1	5	2	0	2
• Non-Legal Adult	82	75	60	48	85	55
• Legal Adult	17	23	35	50	15	43
Mean Size (mm)	111	113	115	119	115	
Minimum Size (mm)	20	30	30	30	45	
Maximum Size (mm)	141	145	142	148	142	
<u>FALL 1985</u>						
TOTAL ABALONE	97	63	65	112	33	370
• Juveniles	1	0	3	2	3	3
• Non-Legal Adult	88	75	72	54	85	65
• Legal Adult	11	25	25	44	12	312
Mean Size (mm)	108	114	113	119	109	
Minimum Size (mm)	35	50	34	23	32	
Maximum Size (mm)	140	148	152	160	146	

Table 27. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodfi*) in fixed plots at Ford Point, Santa Rosa Island

	QUADRAT 535	QUADRAT 536	QUADRAT 537	QUADRAT 538	QUADRAT 539	STATION SUMMARY
<u>SPRING 1987</u>						
TOTAL ABALONE	34	40	7	18	22	121
• Juveniles	0	0	0	0	0	0
• Non-Legal Adult	79	82	43	72	73	78
• Legal Adult	21	18	57	28	27	22
Mean Size (mm)	112	106	119	118	115	
Minimum Size (mm)	50	47	76	60	62	
Maximum Size (mm)	136	134	136	135	136	
<u>FALL 1986</u>						
TOTAL ABALONE	57	89	25	32	35	238
% Juveniles	2	4	12	6	3	3
• Non-Legal Adult	86	88	76	78	83	89
• Legal Adult	12	8	12	16	14	8
Mean Size (mm)	107	96	99	107	110	
Minimum Size (mm)	35	36	30	26	40	
Maximum Size (mm)	134	137	134	136	137	
<u>SPRING 1986</u>						
TOTAL ABALONE	78	76	38	48	47	287
• Juveniles	4	1	5	6	4	3
• Non-Legal Adult	78	80	82	73	74	83
• Legal Adult	18	18	13	21	21	14
Mean Size (mm)	106	103	108	105	107	
Minimum Size (mm)	30	42	23	28	39	
Maximum Size (mm)	139	149	136	140	143	
<u>FALL 1985</u>						
TOTAL ABALONE	85	109	48	53	47	342
• Juveniles	1	0	0	0	0	0
• Non-Legal Adult	84	82	94	74	77	83
• Legal Adult	15	18	6	26	23	17
Mean Size (mm)	104	100	107	108	112	
Minimum Size (mm)	41	45	49	46	50	
Maximum Size (mm)	155	141	138	141	144	

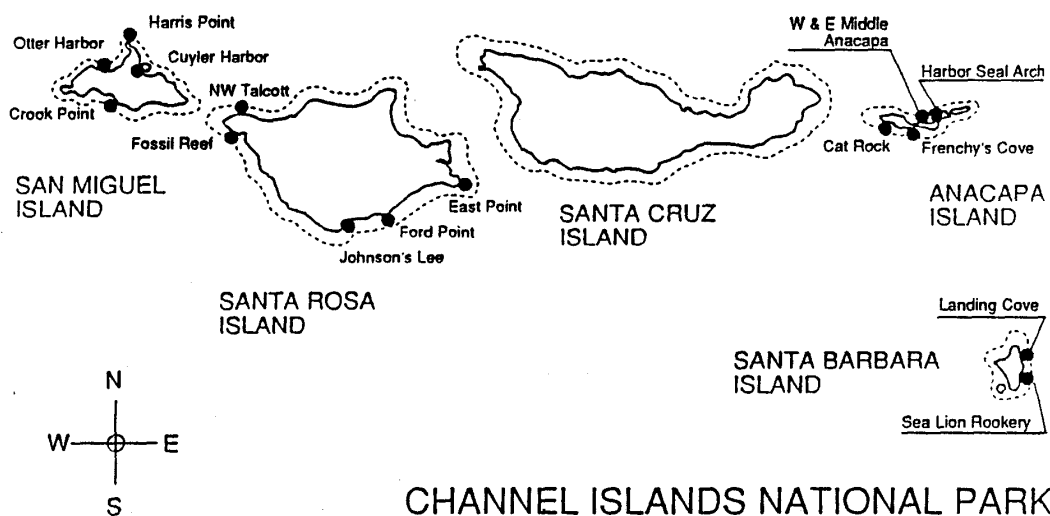
Table 28. Abundance and size distribution (percent) of black abalone (*Haliotis cracherodii*) in fixed plots at Northwest site, Santa Rosa Island

	QUADRAT 570	QUADRAT 571	QUADRAT 572	QUADRAT 573	QUADRAT 574	STATION SUMMARY
SPRING 1987						
TOTAL ABALONE	86	115	128	96	76	501
• Juveniles	1	3	2	2	1	2
• Non-Legal Adult	86	78	69	68	46	59
• Legal Adult	13	19	29	30	53	40
Mean Size (mm)	102	103	111	106	118	
Minimum Size (mm)	23	40	21	31	42	
Maximum Size (mm)	157	140	151	146	149	
FALL 1986						
TOTAL ABALONE	86	124	74	118	81	483
• Juveniles	2	2	0	5	0	3
• Non-Legal Adult	84	78	43	72	49	60
• Legal Adult	14	19	57	23	51	36
Mean Size (mm)	104	103	125	104	119	
Minimum Size (mm)	30	30	60	25	45	
Maximum Size (mm)	146	142	143	143	145	

Table 29. Abundance and size distribution of black abalone (*Haliotis cracerodii*) in fixed plots at East Point site, Santa Rosa Island

<u>SPRING 1987</u>	TRANSECT
TOTALABALONE	80
% Juveniles	0
% Non-Legal Adult	92
% Legal Adult	8
Mean Size (mm)	104
Minimum Size (mm)	57
Maximum Size (mm)	133
 <u>FALL 1986</u>	
TOTALABALONE	58
% Juveniles	4
% Non-Legal Adult	91
% Legal Adult	5
Mean Size (mm)	100
Minimum Size (mm)	38
Maximum Size (mm)	132

FIGURE 1: Rocky Intertidal Community monitoring site locations at Channel Islands National Park



CHANNEL ISLANDS NATIONAL PARK  
• Rocky Intertidal Community Monitoring Locations